

28-OCT-09
18:06:44

GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
40' CURB-CURB; 6 BEAMS; 140' SPAN; 40' TALL; BRIDGE 13 ; PIER 21

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP					
OPTIONS											EC KSI	ES KSI	STRAIN	FACT	MAIN SIZE	STR TOP	MAX	MAX	MIN	MIN	TOP	MIN	MIN	DEPTH	BOT
D D D L	2	1	13	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00	

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	21.625	6.000	4.000	6.000	6.000	4.000	15.625	18.000	7.200	4.800					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		40.000	0.000	12.000	6.000	12.000	6.000	6.000	0.000	12	6	11	12	6	11	34	16	11	34	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	14.000	14.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND	* WIND FORCE										* WIND ON PIER								
STANDARD	TRANS.	LONG.	WIND	FT1	FT1	WIND ON SUPERSTRUCTURE	INTENSITIES	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	APT	APL	APT	APL
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	17.838			

GROUP III WIND	* WIND ON LIVE LOAD										* LENGTHS OF LL		* WIND ON LL												
STANDARD	TRANS.	LONG.	WIND	FT1	FT1	WIND ON LIVE LOAD	INTENSITIES	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	TRANS.	LONGI.	APT	APL						
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES	SHRINKAGE	STREAM
COEFFICIENT	COEFFICIENT	FLOW
0.00018000	0.00044000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	265.846	301.437	0.000	602.875	0.000	301.437	265.846					
LL 1	1	80.157	57.255	0.000	0.000	0.000	0.000	0.000					
LL 2	2	80.157	99.242	0.000	95.425	0.000	0.000	0.000					
LL 3	3	80.157	99.242	0.000	190.848	0.000	41.987	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	57.255	80.157					
LL 5	2	0.000	0.000	0.000	95.425	0.000	99.242	80.157					
LL 6	3	0.000	41.987	0.000	190.848	0.000	99.242	80.157					
LL 7	1	0.000	28.627	0.000	108.784	0.000	0.000	0.000					
LL 8	2	55.346	108.784	0.000	110.692	0.000	0.000	0.000					
LL 9	3	55.346	108.784	0.000	192.758	0.000	55.346	0.000					
LL10	2	0.000	41.986	0.000	190.848	0.000	41.987	0.000					
LL11	3	80.157	99.242	0.000	190.848	0.000	41.987	0.000					
LL12	2	80.157	57.255	0.000	0.000	0.000	57.254	80.157					
LL13	3	80.157	99.242	0.000	95.425	0.000	57.254	80.157					

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE													* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF			
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	40.000	0.000	0.000	0.000	6.000	1.000	40.000	40.000			
DEAD LOAD TOTAL	1	1992.591	0.000	0.000	0.000	2359.791	9262.535	-9262.535	0.000	0.000	0.000	0.000			
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-548.048	-548.048			
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-107.028	-17.838	-713.520	-713.520			
GROUP 2 WIND 1 1	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	-107.028	-17.838	-713.520	-713.520			
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	107.028	17.838	713.520	713.520			
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	-326.111	-34.218	-1489.522	-1489.522			

										PIER-40-6-140-40.OUT					
GROUP	WIND	2	2	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	326.111	34.218	1489.522	1489.522
GROUP 2	WIND	3	1	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	-545.193	-50.598	-2265.525	-2265.525
GROUP 2	WIND	3	2	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	545.193	50.598	2265.525	2265.525
GROUP 2	WIND	4	1	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	-691.248	-61.518	-2782.860	-2782.860
GROUP 2	WIND	4	2	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	691.248	61.518	2782.860	2782.860
GROUP 2	WIND	5	1	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	-800.789	-69.708	-3170.861	-3170.861
GROUP 2	WIND	5	2	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	800.789	69.708	3170.861	3170.861
GROUP 3	WIND	1	1	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	-32.108	-5.351	-214.056	-214.056
GROUP 3	WIND	1	2	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	32.108	5.351	214.056	214.056
GROUP 3	WIND	2	1	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	-170.352	-13.625	-633.616	-633.616
GROUP 3	WIND	2	2	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	170.352	13.625	633.616	633.616
GROUP 3	WIND	3	1	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	-308.596	-21.899	-1053.175	-1053.175
GROUP 3	WIND	3	2	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	308.596	21.899	1053.175	1053.175
GROUP 3	WIND	4	1	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	-400.758	-27.415	-1332.882	-1332.882
GROUP 3	WIND	4	2	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	400.758	27.415	1332.882	1332.882
GROUP 3	WIND	5	1	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	-469.880	-31.552	-1542.661	-1542.661
GROUP 3	WIND	5	2	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	469.880	31.552	1542.661	1542.661
LIVE LOAD	LL	1	1	1	137.412	-2061.180	0.000	2061.180	137.412	2061.180	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL	2	1	1	274.824	-2514.639	0.000	2514.639	274.824	2514.639	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

													* TRANSVERSE			LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF						
LIVE LOAD LL 3	1	371.011	-1855.062	0.000	1855.062	371.011	2263.176	-408.114	0.000	0.000	0.000	0.000						
LIVE LOAD LL 4	1	137.412	2061.180	0.000	-2061.180	137.412	0.000	-2061.180	0.000	0.000	0.000	0.000						
LIVE LOAD LL 5	1	274.824	2514.640	0.000	-2514.640	274.824	0.000	-2514.640	0.000	0.000	0.000	0.000						
LIVE LOAD LL 6	1	371.011	1855.062	0.000	-1855.062	371.011	408.114	-2263.176	0.000	0.000	0.000	0.000						
LIVE LOAD LL 7	1	137.411	-309.172	0.000	309.172	137.411	309.172	0.000	0.000	0.000	0.000	0.000						
LIVE LOAD LL 8	1	274.822	-2171.095	0.000	2171.095	274.822	2171.095	0.000	0.000	0.000	0.000	0.000						
LIVE LOAD LL 9	1	371.011	-1416.022	0.000	1416.022	371.011	1953.986	-537.963	0.000	0.000	0.000	0.000						
LIVE LOAD LL10	1	274.821	0.011	0.000	-0.011	274.821	453.449	-453.460	0.000	0.000	0.000	0.000						
LIVE LOAD LL11	1	371.011	-1855.062	0.000	1855.062	371.011	2263.176	-408.114	0.000	0.000	0.000	0.000						
LIVE LOAD LL12	1	274.823	-0.011	0.000	0.011	274.823	2061.180	-2061.169	0.000	0.000	0.000	0.000						
LIVE LOAD LL13	1	371.011	-408.123	0.000	408.123	371.011	2263.176	-1855.052	0.000	0.000	0.000	0.000						

□ CAP ANALYSIS AND DESIGN DATA

													** CAP MOMENTS AND SHEARS			
MOMENTS(KIP-FEET)								SHEARS(KIPS)								
POINT	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT			
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-364.533	-18.933	-364.533	-18.933	-538.554			
P 2	-2825.844	-2825.844	-4078.794	-2825.844	-2825.844	-2825.844	-3576.113	-413.810	-805.678	-413.810	-805.678	-587.831	-1195.153			
P 3	-6789.883	-6789.883	-9912.314	-6789.883	-6789.883	-6789.883	-8659.603	-847.155	-847.155	-847.155	-847.155	-1236.631	-1236.631			
C 1L	-12041.295	-12041.295	-17500.576	-12041.295	-12041.295	-12041.295	-15310.327	-903.315		-903.315		-1292.791				
C 1R	-12041.295	-12041.295	-17500.578	-12041.295	-12041.295	-12041.295	-15310.327		903.315		1292.791		903.315			
P 5	-6789.883	-6789.883	-9912.314	-6789.883	-6789.883	-6789.883	-8659.603	847.155	847.155	1236.631	1236.631	847.155	847.155			
P 6	-2825.844	-2825.844	-4078.794	-2825.844	-2825.844	-2825.844	-3576.114	805.678	413.810	1195.153	587.831	805.678	413.810			
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	364.533	18.933	538.554	18.933	364.533	18.933			

													CAP DESIGN DATA			
PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE.		BOT. REINFORCE.		LEFT STIRRUPS		RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
			AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN BAR&SPAC	M.SP.	AV/IN BAR&SPAC						
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000 #5@ 0.00	24.00	0.060 #5@10.33	59.14		0.08	0.000	0.099	
P 2	-2173.726	-2750.856	11.89	8 # 11	3.12	2 # 11	24.00	0.060 #5@10.33	24.00	0.159D#5@ 7.81	81.25		0.22	0.542	1.236	
P 3	-5222.987	-6661.233	24.60	16 # 11	3.12	2 # 11	24.00	0.120 #5@ 5.18	24.00	0.120 #5@ 5.18	96.00		0.41	0.587	1.014	
C 1	-9262.535	-11777.175	45.07	29 # 11	3.12	2 # 11	24.00	0.133 #5@ 4.65	24.00	0.133 #5@ 4.65	96.00		0.73	0.586	0.939	
P 5	-5222.987	-6661.233	24.60	16 # 11	3.12	2 # 11	24.00	0.120 #5@ 5.18	24.00	0.120 #5@ 5.18	96.00		0.41	0.587	1.014	
P 6	-2173.726	-2750.857	11.89	8 # 11	3.12	2 # 11	24.00	0.159D#5@ 7.81	24.00	0.060 #5@10.33	81.25		0.22	0.542	1.236	
P 7	-25.482	-25.483	3.12	2 # 11	3.12	2 # 11	24.00	0.060 #5@10.33	0.00	0.000 #5@ 0.00	59.14		0.08	0.000	0.099	

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS																					
CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL 2	0.0					3187.0	-5459.3	0.0	3187.0	5637.5	2161.8	15557.2	27578.7	10575.6	4.890	72.00	144.00
1	B		3	LL13	5.1					3550.0	1385.5	-3929.1	3550.0	4394.4	4422.7	13762.8	17046.1	17156.1	3.879	72.00	144.00

COLUMN DESIGN DATA																				
CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3426.	108348.	1.033	1.131	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3311.	108348.	1.032	1.126	1.000	2	0.70

FOOTING 1 DESIGN LOADS																			
F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 3	4.1				2671.906	2777.646	24.335	-2812.612	-54.037	214.272	104.662	181.977	291.587	97.508	0.000	21.294	MAX.P1
1	3	LL 2	1.1				3368.284	5104.963	46.874	-1703.198	-32.593	212.534	146.182	288.564	354.916	132.727	0.000	26.816	MAX.MT
1	3	LL 2	3.1				3368.284	4695.892	38.807	-2794.053	-54.105	239.831	130.869	261.267	370.229	130.159	0.000	26.816	MAX.VT
1	3	LL 3	3.1				3473.477	3974.557	38.807	-3292.777	-63.078	266.126	137.835	248.998	377.288	129.043	0.000	27.682	MAX.VP
1	3	LL 3	4.1				3473.477	3610.939	31.636	-3656.396	-70.249	278.554	136.060	236.570	379.064	268.783	53.595	27.682	MAX.ML
1	3	LL 3	4.1				3473.477	3610.939	31.636	-3656.396	-70.249	278.554	136.060	236.570	379.064	268.783	53.595	27.682	MAX.VL
1	3	LL 2	4.1				2590.988	3332.519	24.335	-2428.979	-47.135	194.046	99.302	191.414	286.158	98.367	0.000	20.628	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS													
FOOTING SIZE				* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC	
17.500	17.500	5.000	0.993	0.92	27 # 7	@ 7.750	TOP TRAN	177.104	52.249	104.498	43.292	0.000	
				1.38	20 #10	@10.500	BOT.LONG	281.801	53.543	107.086	44.365	0.000	

NUMBER OF PILES = 15 BP = 3.750 DP = 7.500